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ABSTRACT

Test anxiety is a variable cognitive, affective, or physiological response, or any combination thereof, occurring during evaluative, self-report examinations. Research suggests that the cognitive, affective, and physiological components of test anxiety are interrelated and that these components in addition to global test anxiety, are negatively related to test performance. A variety of methods exist to assess test anxiety. Several self-report instruments assess global test anxiety as well as its cognitive and affective components, while the physiological component is usually measured with the aid of electronic recording equipment. Theories of the relationship between test anxiety and test performance emphasize attentional processes which are most directly associated with the cognitive and physiological components. Treatment of test anxiety should reduce or eliminate the adverse test anxiety experience and result in test performance improvement. Traditional approaches may be applied to test anxiety, or a treatment package may be constructed to deal with those problem-specific components of test anxiety which have been empirically demonstrated to be related to test performance. (Author/NRB)

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Anxiety and Test Performance

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Anxiety and Test Performance

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One of the most important human performances is that which yields an individual's score on evaluative examinations or tests. As noted by Seymour Sarason in 1959, "We live in a test-conscious, test-giving culture in which the lives of people are in part determined by their test performance" (S. Sarason, 1959, p. 26). Starting as a young child, one is bombarded by a seemingly endless succession of examinations, including IQ tests, college entrance examinations, tests required for admission to graduate and professional schools, and examinations needed to gain certification and licensure. Furthermore, it is not uncommon for selection committees to choose candidates on the basis of a test score difference at the second decimal point (Berkley, Note 1). Such widespread reliance on succinct assessment of potential attests to the importance of everyone's test performance.

Unfortunately, some individuals report worry and tension in connection with the preparation for and the taking of tests, a phenomenon referred to as "test anxiety." These aversive experiences reportedly cause these individuals to study ineffectively, to "block" or "choke" in the evaluative situation, and thereby to perform more poorly than they should (Spielberger, 1966). Such complaints may not be ill founded, for, in fact, it has been shown in numerous studies that those who complain of test anxiety do perform more poorly than those who do not (Holroyd, Westbrook, Wolf, & Badhorn, 1978).

In addition to impaired test performance, test anxiety appears related to other undesirable responses such as excessive self-criticism, avoidance of tests, drug abuse, and suicide (Atkinson, 1964; Brown, 1938; I. Sarason,

1960). Furthermore, the incidence of test anxiety appears to be increasing at least among college students (Bronzaft & Epstein, 1973). These features of test anxiety evince not only its importance but also the necessity of "easing" the test-taking individual. Hence, as noted by Jeri Wine in 1971 and again this year, it appears that it is now time to examine test anxiety as an intrinsically serious problem and not just a medium through which to assess the efficacy of one's favorite treatment technique.

Such an examination is the purpose of my talk this morning. For the next several minutes I will review with you the various aspects of test anxiety as they have been reported in the experimental literature. Specifically, I will discuss the definition of test anxiety, the approaches currently available for its assessment, its nature, the effects of test anxiety on test performance, the theories proposed to account for those effects, and finally the treatment of test anxiety. Let's begin with a look at definitions.

Definition

Upon examination, one sees an evolution in the definition of test anxiety. The construct was initially defined by Mandler and Sarason in 1952 as a "learned anxiety drive" which elicits two types of responses, task-relevant responses and task-irrelevant responses. The task-irrelevant responses were postulated to interfere with test performance and were characterized as "feelings of inadequacy, helplessness, heightened somatic responses, anticipations of punishment or loss of status and esteem, and implicit attempts at leaving the test situation" (Mandler & S. Sarason, 1952, p. 166). The construct has also been defined as the single cognitive response of worry (Wine, 1971), as simple heightened physiological activity (Geen, 1980), as a combination of worry and heightened physiological activity (I. Sarason,

1960), and as a combination of worry and affect, that is, subjective awareness of physiological activity (Liebert & Morris, 1967). More recently, investigators have emphasized the combination of three components. Some specify cognitive, affective, and behavioral components (Hollandsworth, Glazeski, Jones, & Van Norman, 1979), while a separate group emphasizes the cognitive, affective, and physiological components (Holroyd et al., 1978). In line with this last group of investigators, for present purposes we will define test anxiety as a variable cognitive, affective, or physiological response, or any combination thereof, occurring during evaluative examinations of the self-report variety.

Given this inclusive definition, the cognitive, affective, and physiological components deserve separate elaboration. Turning first to the cognitive component, we find that this response may take a number of forms. One is known as "blocking" or the inability to recall correct answers. A second form of the cognitive component is "flooding" or the recall of irrelevant material at the expense of recall of the desired answer. Third, individuals complain of an inability to concentrate and keep their attention on the task and off self-directed and self-critical thoughts. These worrisome and self-critical thoughts are most frequently the target of efforts to assess the cognitive component. Finally, some find at a later time that they had misread directions or questions on a test.

The physiological component refers to autonomic hyperactivity. Such a response may include increased heart rate, increased blood pressure, sweating, rapid, shallow, and irregular respiration, increased muscle tension, increased urination and bowel movements, and an inability to sleep.

Finally, the affective component in general refers to the subjective experience of the physiological hyperactivity. Such experiences may take

the form of feelings of tension, nausea, uneasiness, chills, heart pounding, and "butterflies in the stomach."

This concludes our review of the definition of test anxiety. As you can see, the construct has been defined in a number of ways, each being more inclusive than those preceding it. Also note that the three specified components of test anxiety are themselves rather elaborate and complex responses. Let us now look at the way test anxiety has been assessed.

Assessment

A variety of methods are available for the assessment of test anxiety. The cognitive and affective components are typically assessed via self-report instruments, which may measure either situationally specific levels (states) or typical levels (traits). The physiological component is usually assessed with the aid of electronic recording equipment such as a polygraph. Such measures are by definition situationally specific, that is, state in nature. On the other hand, one may choose to obtain combined measures of the cognitive and affective components, that is, measures of "global test anxiety." This type of assessment is accomplished with self-report instruments, and the scores reflect summed levels of undifferentiated components. Like measures of individual components of test anxiety, measures of global test anxiety may be either state or trait in nature. It is important to note that all measures of test anxiety are constructed to yield scores which correlate positively with the magnitude of the construct being assessed.

Looking for a moment at the self-report instruments used to measure global test anxiety and the cognitive and affective components, we see that the instruments differ on several dimensions (see Wine, 1971). As stated previously, self-report measures may be either state or trait in nature. The

questionnaires may also vary as a function of the number of situations specified. For instance, the instrument may seek information about responses prior to, during, or after a test, a speech, an athletic performance, or any combination of a number of evaluative situations. In addition, self-report instruments differ with regard to the age and educational level of those for whom they were constructed. The self-report instruments, as you can see, come in a number of forms. An examination of the instruments designed specifically to assess global test anxiety as well as its components will further elucidate the characteristics of these assessment devices.

Several instruments are available to assess global test anxiety. Trait measures may be obtained with the Test Anxiety Questionnaire (Mandler & S. Sarason, 1952), which consists of 37 items rated with respect to the intensity of reactions typically experienced prior to and during tests. Another trait measure is the Test Anxiety Scale (I. Sarason, 1978). This questionnaire also consists of 37 items though in a true-false format. Cognitive and affective components are measured as they generally occur before, during, and after tests. The Achievement Anxiety Test (Alpert & Haber, 1960) is a trait scale which yields both a facilitating and a debilitating anxiety score. The 19 items are rated on a 5-point scale from "never" to "always," and they reflect both cognitive and affective experiences as they usually occur in association with exams. Finally, the most recent addition to the field of trait measures is the Test Anxiety Inventory, a scale of 20 cognitive and affective items rated on a 4-point frequency scale (Spielberger, Gonzalez, Taylor, Algaze, & Anton, 1978).

Though fewer in number, state measures of global test anxiety are also available. In fact, there are only two that have been used. The first is the Worry-Emotionality Questionnaire which consists of 10 items rated on a

5-point intensity scale (Liebert & Morris, 1967). The second state measure of global test anxiety is not a test anxiety scale at all but a state measure of general anxiety which has been used in testing situations. The scale I speak of is the Multiple Affect Adjective Check List, a collection of 102 adjectives which load most heavily on 3 factors labeled anxiety, depression, and hostility (Zuckerman & Lubin, 1965).

Only one instrument has been widely used to assess the cognitive component. The Worry-Emotionality Questionnaire, mentioned earlier in connection with state measures of global test anxiety, consists of two subscales, an affective one and a cognitive one. The latter yields a score reflecting the intensity of worry experienced during a testing situation.

Finally, the affective component may be assessed in several ways. Trait as well as state measures have been obtained with the State-Trait Anxiety Inventory, a questionnaire consisting of 20 cognition and affect items rated on a 4-point intensity scale (Spielberger, Gorsuch, & Lushene, 1970). The Activation-Deactivation Adjective Check List has been used to obtain state measures of the affective component (Thayer, 1967). This scale consists of 49 adjectives rated on a 4-point scale. The most widely used state measure of affect has been the affect subscale of the Worry-Emotionality Questionnaire. As described earlier, this subscale consists of five items rated on the basis of intensity on a 5-point scale. These self-report instruments for the assessment of global test anxiety and its components that I have covered represent but the most widely used devices. Others not reviewed here are also available and most likely have been used in a study or two. Before leaving the topic of assessment, I want to explore with you the extent to which measures of global test anxiety and its separate components are related. In this review of data and in those which follow, please keep in mind that all

results are significant at the .05 level or less and that scale scores correlate positively with the magnitude of the construct being measured.

A number of studies have explored the relationships between global test anxiety on the one hand and each of its components on the other. For instance, high scorers on trait measures of global test anxiety have obtained higher scores on state measures of the cognitive and affective components than have low scorers (Holroyd et al., 1978). Correlation analyses have demonstrated inverse relationships between state measures of the cognitive and affective components on the one hand and both state and trait measures of global test anxiety on the other (e.g., Morris & Perez, 1972). Correlation coefficients range from .32 to .92 for the relationship between measures of global test anxiety and the cognitive component and from .28 to .90 for the relationship between measures of global test anxiety and the affective component (e.g., Deffenbacher, 1977; Morris & Perez, 1972; Wittmaier, 1974). Regarding physiological activity, compared to low scorers high scorers on trait measures of global test anxiety have displayed lower measures of heart rate variability but higher measures of skin conductance (Holroyd et al., 1978; Kissel & Littig, 1962). Correlation analyses have revealed a coefficient of .31 between scores on trait measures of global test anxiety and heart rate scores (Harleston, Smith, & Arey, 1965).

This concludes my discussion of the assessment of test anxiety. A number of different assessment devices are available as shown by this review which though incomplete was fairly representative of the literature. Also, global test anxiety appears at least moderately related to each of the three components of test anxiety. I have thus far said nothing of the interrelationships between the cognitive, affective, and physiological components of test anxiety, a topic to which I now turn.

Nature of Test Anxiety

When I refer to the interrelationships between the three components of test anxiety, I am literally addressing the nature of the problem. A substantial body of literature deals with the nature of test anxiety, and I would like to summarize it for you now. State measures of the cognitive and affective components have correlated together in the range from .27 to .76 (e.g., Deffenbacher, 1980; Morris & Liebert, 1970). State measures of cognition have correlated with physiological measures of heart rate in the range of .29 to .56 (Endler & Magnusson, 1977; Morris & Liebert, 1970). Last, state measures of the affective component and physiological measures of heart rate are associated with a correlation coefficient of .38 (Endler & Magnusson, 1977). It thus appears that the three components are interrelated and that for some reason there exists a glaring discrepancy between physiological activity, at least heart rate, and subjects' perception of it.

Effects of Test Anxiety

The complaints that test anxiety causes reduced test performance may not be ill founded, for a relationship between test anxiety and test performance has been demonstrated in numerous studies. Turning first to measures of global test anxiety, it has been shown that high scorers on trait measures of global test anxiety surpass low scorers on tests and grade point averages (e.g., Hollandsworth et al., 1979; Nottleman & Hill, 1977). Correlation analyses have revealed that trait measures of global test anxiety negatively correlate with test scores. The range of correlation coefficients is -.12 to -.65 (Lunneborg, 1964; I. Sarason, 1959). Scores on state measures of global test anxiety have also been found to correlate negatively with test scores. The range of correlation coefficients in this case is -.27 to -.42 (e.g., Deffenbacher, 1977, 1978).

Regarding the cognitive component, we find that low scorers on state measures of the cognitive component have exhibited superior performance scores compared to high scorers (e.g., Deffenbacher, 1977). Investigators have also found that state measures of the cognitive component correlate negatively with test scores. The range of correlation coefficients is 0.23 to 0.37 (Deffenbacher, 1977; Morris & Liebert, 1970). Partial correlation analyses have revealed little reduction in these correlation coefficients when the effects of affect are controlled (see Deffenbacher, 1980).

The relationship between the affective component and test performance has also been examined. For instance, it has been found that low scorers on state measures of the affective component have attained greater test scores than have high scorers (e.g., Deffenbacher, 1977). Furthermore, scores on both state and trait measures of the affective component have been shown to correlate negatively with test scores. The range of correlation coefficients is -.18 to -.29 for the state affect scores (e.g., Deffenbacher, 1977; Snyder & Katahn, 1973). A single correlation coefficient of -.20 has been reported for trait affect scores (Joesting & Whitehead, 1977). Partial correlation analyses have deomnstrated that these correlation coefficients shrink to nonsignificance when the effects of cognition are partialled out (see Deffenbacher, 1980).

The little research relating physiological activity and test performance has shown test scores to be inversely related to measures of heart rate; a correlation of -.41 has been obtained (Harleston et al., 1965). In another study, solution times on a test correlated at -.38 with heart rate variability scores (Holroyd et al., 1978).

On the basis of these findings, it seems reasonable to conclude, as did Deffenbacher (1980) earlier this year, that the cognitive component forms

a consistent, negative relationship with test performance, that the relationship between the affective component and test performance is negative but less consistently so than the cognitive component, and that the cognitive component is more important as a source of variance than the affective component. The paucity of data on the physiological correlates of test performance precludes conclusion at this time, while the abundance of data on global test anxiety suggests a definite relationship between this variable and test performance. All in all, the data are consistent with the contention that test anxiety causes some degree of performance decrement. One may rightfully ask how this influence comes about, and it is for the purpose of providing partial answer to this question that I now turn to a review of the theoretical notions on the relationship.

Theories of Effect of Test Anxiety on Test Performance

Several theories have been proposed in an effort to account for the relationship shown between test anxiety and test performance. The first such theory was advanced by Mandler and Sarason in 1952. Defining test anxiety as a learned anxiety drive, these investigators further proposed that such a drive elicits both task-relevant and task-irrelevant responses. The task-relevant responses facilitate the successful completion of the task, while the task-irrelevant responses interfere with test performance. The task-irrelevant responses include feelings of inadequacy, autonomic hyperactivity, and implicit attempts to escape the testing situation. This theory, an outgrowth of drive theory in general, spurred much of the early research and assessment instrument development.

A second theory, advanced by Geen (1980), posits that is is physiological component which is responsible for decrements in test performance and that such a relationship is mediated by "range of cue utilization."

A term borrowed from Easterbrook (1959), "range of cue utilization" has since been defined by Geen and others as the total number of environmental cues or stimuli attended to by an individual in a given period of time (e.g., Geen, 1980). According to Geen's theory, the physiological component of test anxiety is negatively related to range of cue utilization, which itself is positively related to test performance. In other words, as anxiety increases, range of cue utilization decreases, thereby producing decreases in test performance.

Sarason (e.g., 1960) and Wine (1971) proposed a third theory, which posits cognitive activity, i.e., the cognitive component, as the critical test anxiety component and the tendency of the cognitive component to direct attention away from the test as the mediating variable. The theory states, in other words, that the cognitive component causes misdirected attention which leads to reductions in test scores.

In summary of the theories, it appears that attentional processes have received most emphasis. In fact, if one assumes the plausible hypothesis advanced by Geen (1980) that misdirected attention can affect test performance only via its effect on range of cue utilization, then it follows that each of the theories, in its own way, posits range of cue utilization as a mediator between test anxiety and test performance. Spotlighting attentional processes in this way should aid in the construction of treatment strategies and techniques, a topic to which I now turn my own attention.

Treatment

An adequate treatment of test anxiety should serve two purposes. First, it should eliminate or at least reduce the aversiveness of the test anxiety experience; by that I mean the worry, tension, panic, and arousal

associated with the three components. Second, if a causal relationship between test anxiety and test performance does in fact exist, as suggested by our summary of the data, then any adequate treatment strategy should also result in test performance improvement.

Given this duo of purposes, the therapist of the test anxious individual has two approaches to treatment from which to choose. First, he may decide to apply one of the widely employed treatment techniques that have been successfully applied to other forms of anxiety. Such techniques include implosion, relaxation, systematic desensitization, modeling, cognitive restructuring, and EMG biofeedback. All of these techniques have been demonstrated effective with anxiety occurring in a number of situations. On the other hand, the therapist may choose to treat the total constellation of components of test anxiety by combining whatever means are available for the treatment of each. This latter option represents the move to fit treatment to the problem rather than mere assessment of the efficacy with regard to test anxiety of one's favorite treatment technique. I would like to discuss the treatment of test anxiety from these two perspectives.

Looking at the time-honored treatment techniques, we see that a number of them have been evaluated experimentally (see Allen, Elias, & Zlotlow, 1980 for a review). The most popular of these approaches is systematic desensitization, which has been found effective not only in reducing global test anxiety, heart rate, and the affective component but also in increasing test performance. Implosion therapy, on the other hand, has thus far been shown to reduce only global test anxiety. Both modeling and relaxation procedures have influenced global test anxiety, unpleasant affect, heart rate, and test performance, while EMG biofeedback has been shown effective only in reducing global test anxiety. Finally, cognitive restructuring has

also been shown effective in reducing global test anxiety and affect and in increasing test performance. Looking at these general strategies as a group, we see that global test anxiety, the affective and physiological components, and test performance are alterable; however, no studies have examined whether any of these techniques is effective in reducing the cognitive component of unnecessary worry.

As stated earlier, there is a second, alternative approach to the treatment of test anxiety, and it consists of the development of treatment packages which incorporate treatment components designed specifically to deal with each of the empirically demonstrated components of the problem. Treatment package development thereby becomes a process of matching treatment components with problem components. Let's see how this might be done with test anxiety.

We have summarized a mass of research which demonstrate that the cognitive, affective, and physiological components of test anxiety are in different degrees negatively related to test performance. Our task then is to find strategies to deal with each of these relevant components.

First, the cognitive component. It has been demonstrated that self-statement training is an effective means of reducing task-irrelevant cognitive activity among test anxious individuals (Finger & Galassi, 1977). This approach consists of having the individual memorize a set of statements to be spoken to oneself in anticipation of and during testing situations. The statements not only preclude self-critical cognition, due to the impossibility of saying two things to oneself at the same time, but they also may be used to redirect the individual's attention to relevant cues in the task.

A very effective means of reducing levels of both the affective and physiological components is relaxation training (Bernstein & Borkovec, 1973).

As typically prescribed, this procedure requires the individual to practice twice daily a 30-40 minute routine to systematic tensing and releasing 16 major muscle groups located throughout the body. The number of groups involved may be gradually reduced with practice from 16 to 7 to 4 and finally to 0. Furthermore, if followed correctly, this procedure facilitates what has been labeled "conditioned relaxation" or "cue-controlled relaxation." Here, as a result of continuous pairing with the relaxed state, a cue such as the word "relax" acquires the capacity, when covertly spoken, to elicit that relaxed state. Cue-controlled relaxation can then be used to reduce the affective and physiological components of test anxiety when they occur during imaginal and/or practice testing situations as well as during the taking of actual tests.

These, then, are two separate procedures which together reduce all three components of test anxiety. My own experience with treatment packages of this sort is consistent with that of others reported in the literature (see Denney, 1980), namely that such packages lead to the reduction of irrelevant cognitive activity, the reduction of unpleasant affect, the reduction of physiological activity, and the increase in test performance.

Summary

In summary of this brief overview of the area of test anxiety, it appears that the problem consists of three component responses, that each is related to the others, and that these components of test anxiety as well as global test anxiety are negatively related to test performance. Theories of this relationship emphasize attentional processes which are most directly associated with the cognitive and physiological components. Finally, regarding treatment, one may choose a traditional approach and apply it to test anxiety, or one may opt to construct a treatment package to deal with

those problem-specific components of test anxiety which have been empirically demonstrated to be related to test performance. In all, it appears that test anxiety is a well-understood phenomenon and that such understanding can be effectively utilized both to ease the test-taking individual and to increase the scores resulting from this oftentimes important human performance. Thank you.

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